

# Factors Responsible for Conversion of Laparoscopic to Open Cholecystectomy

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## A B S T R A C T

**Introduction:** Gall stone disease is a global health problem. Earlier open cholecystectomy was the surgery of choice but with advancement in medical technology laparoscopic cholecystectomy came into existence, and became a gold standard treatment for gall bladder disease. However, few patients required conversion to open cholecystectomy from laparoscopic cholecystectomy. Reasons for such conversion as reported in literature are difficulty in creation of pneumoperitoneum, abnormal bleeding at the time of pneumoperitoneum, frozen Calot's triangle, anomaly in biliary tract, dense adhesions, abnormal bleeding during Calot's dissection, excessive liver bed bleeding, common bile duct injury, bowel injury. Present study aimed to identify factors commonly responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy.

**Material and methods:** 120 patients who fulfilled the inclusion criterias and underwent laparoscopic cholecystectomy in the department of General Surgery, Rohilkhand Medical College and Hospital, Bareilly. This study aims to identify the factors commonly responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy.

**Results:** A total of 120 laparoscopic cholecystectomies were performed, out of which ten cases required conversion. Factor responsible for conversion were dense adhesion in five cases, obscured anatomy at frozen Calot's in two cases, bleeding cystic artery in two cases and common bile duct injury in one case.

**Conclusion:** This study demonstrates that adhesion was the most common reason for conversion (50%) followed by frozen Calot's (20%), bleeding cystic artery (20%) and common bile duct injury (10%). Conversion to open cholecystectomy is considered a sign of wisdom, rather than a sign of failure as it minimizes the chances of various serious complications which may arise during difficult laparoscopic cholecystectomy.

**Keywords:** Laparoscopic Cholecystectomy, Laparoscopic Cholecystectomy Conversion, Frozen Calot's

## INTRODUCTION

Gallstone disease is a global health problem. Many patients having no symptoms and gallstones are diagnosed with ultrasonography during the assessment for other disease. Earlier open cholecystectomy was the surgery of choice but with advancement in medical technology laparoscopic cholecystectomy came into existence, and became the gold standard method for symptomatic cholelithiasis.

The first cholecystectomy was performed in 1882. Nearly 100 years later with coming era of minimal invasive surgery the first laparoscopic cholecystectomy was done in 1985, now over the last three decades, laparoscopic cholecystectomy has become gold standard for the surgical treatment of gallbladder. In India the first laparoscopic cholecystectomy was performed in Mumbai, JJ Hospital 1990.<sup>1</sup>

Laparoscopic cholecystectomy has revolutionized minimally invasive procedures. Benefits of laparoscopic cholecystectomy being small incision, relatively less painful, early oral intake, shorter hospital stay, early ambulation, faster recovery, lower incidence of incisional hernia, aesthetically acceptable and

even significantly reduced incidence of wound complications and postoperative ileus.<sup>2,3</sup> Because of acceptance by the surgeon and patient had satisfaction for surgery. Laparoscopic cholecystectomy is accepted worldwide and is highly in demand by the patient.

However, a proportion of patients require conversion to open cholecystectomy from laparoscopic cholecystectomy. Reasons like co-morbidities or previous surgery can prohibit the laparoscopic cholecystectomy in certain patients, besides difficult anatomy, technical factors and the level of surgeon expertise and experience all can play a role in the decision to convert. The conversion to open surgery leads to prolonged hospital stay, increased total cost, and dissatisfaction for patients.

Reasons for such conversion as reported in literature are difficulty in creation of pneumoperitoneum, abnormal bleeding at the time of pneumoperitoneum, frozen Calot's triangle, anomaly in biliary tract, dense adhesions, abnormal bleeding during Calot's dissection, excessive liver bed bleeding, common bile duct injury, hollow viscus injury. Amongst them dense adhesions is the most common

cause followed by obscured anatomy at Calot's triangle for conversion to open cholecystectomy. Conversion should not be considered a technical failure but, rather, accepted as a better surgical practice for the patient and by surgeon when indicated. Our study aimed to identify factors commonly responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy.

## MATERIAL AND METHODS

The present observational, prospective study was carried out from November 2018 to October 2019 in department of surgery at Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh. Study was carried out on all patients admitted for Laparoscopic Cholecystectomy in the department of surgery at Rohilkhand Medical College and Hospital Bareilly, U.P

**Sample Size:** In our study a total of 120 patients were taken which was calculated by the following formula-

$n = [(z_{\alpha/2})^2 \times P \times (100-P)] / e^2$ , where  $z_{\alpha/2}$  is the Z value for particular confidence level determined by alpha value, P is the estimated prevalence and e is the acceptable absolute error.<sup>4</sup>

P=percentage of conversion of laparoscopic cholecystectomy to open

$(100-p) = (100-7.5)$

e = acceptable absolute error = 5%

$[(1.96)^2 \times 7.5 \times (100-7.5)] / (5)^2 = 111 \sim 120$

Data were collected after taking clearance from the

Institutional ethical committee. All participants were explained about the objectives of the study and an informed and written consent was taken. Face-to-face interviews, history taking and physical examination, appropriate radiological, hematological investigation, operative findings were done after explaining the purpose, benefits, risks of the procedure and they were ensured about their anonymity and confidentiality of the study.

## STATISTICAL ANALYSIS

Data analysis were performed with the program Statistical Package for Social Sciences (SPSS) 23

Frequency and percentage of categorical variables such as reason for conversion were analyzed using appropriate test like the Chi square test.

## RESULTS

A total of 120 patients were included in the study.

Table-1 shows the comparison of surgery outcome with age. Conversion of laparoscopic cholecystectomy to open cholecystectomy was higher among age 51-60 years than other age groups. There was no significant ( $p > 0.05$ ) association of age with outcome of surgery.

Table-2 shows the comparison of outcome of surgery with USG findings. Conversion of laparoscopic cholecystectomy to open cholecystectomy was higher among whom chronic cholecystitis with cholelithiasis was present (9.4%). There was no significant ( $p > 0.05$ ) association of outcome of surgery

Age in years	No. of patients	Outcome of surgery				p-value <sup>1</sup>
		Converted		Successful		
		No.	%	No.	%	
18-30	33	2	6.1	31	93.9	0.28
31-40	28	4	14.3	24	85.7	
41-50	33	2	6.1	31	93.9	
51-60	10	2	20.0	8	80.0	
>60	16	0	0.0	16	100.0	

1Chi-square test, NA-Not applicable as >10s in a column

**Table-1:** Comparison of outcome of surgery with age

Ultrasound findings	No. of patients	Outcome of surgery				p-value <sup>1</sup>
		Converted		Successful		
		No.	%	No.	%	
Chronic Cholecystitis with cholelithiasis	96	9	9.4	87	90.6	0.68
Acute cholecystitis with cholelithiasis	21	1	4.8	20	95.2	
Mucocele	3	0	0.0	3	100.0	

1Chi-square test

**Table-2:** Comparison of outcome of surgery with ultrasound findings

Calculi	No. of patients	Outcome of surgery				p-value <sup>1</sup>
		Converted		Successful		
		No.	%	No.	%	
Single	85	4	4.7	81	95.3	0.02*
Multiple	35	6	17.1	29	82.9	

1Chi-square test, \*Significant

**Table-3:** Comparison of outcome of surgery with Calculi

Reasons for conversion	No. (n=10)	%
Adhesion	5	50.0
Obscured anatomy-Frozen Calot's	2	20.0
CBD injury	1	10.0
Bleeding cystic artery	2	20.0

**Table-4:** Distribution of patients according to reasons for conversion

with USG findings.

Table-3 shows the comparison of outcome of surgery with calculi. Conversion of laparoscopic cholecystectomy to open cholecystectomy was higher among whom calculi was multiple (17.1%) than single (4.7%). There was significant ( $p=0.02$ ) association of outcome of surgery with calculi.

Table-4 shows the distribution of patients according to reasons for conversion. Adhesion was the most common reason for conversion (50%) followed by obscured anatomy-frozen Calot's & bleeding cystic artery (20%) and CBD injury (10%).

## DISCUSSION

Laparoscopic cholecystectomy has become the gold standard for management of symptomatic gall bladder stone disease. Laparoscopic cholecystectomy has revolutionized minimally invasive procedures.

Benefits of laparoscopic cholecystectomy being small incision, relatively less painful, early oral intake, shorter hospital stay, early ambulation, faster recovery, lower incidence of hernia, aesthetically acceptable and even significantly reduced incidence of wound complications and postoperative ileus.

However, conversion to open surgery at time may be required. So, a laparoscopic surgeon must be trained in open surgery. The actual rates of conversion reported in literatures are quite variable ranging from 2.6% to 14%.<sup>5</sup>

Conversion to open cholecystectomy is required when safe completion of the laparoscopic procedure cannot be ensured. It is considered as a sound judgement rather than failure of laparoscopic surgery to avoid complications and reduce morbidity. The identification of parameters predicting conversion helps in preoperative planning and avoids laparoscopy associated complications by converting to open procedure as and when appropriate.<sup>6</sup>

The decision of conversion from laparoscopic cholecystectomy to open is usually taken after a considerable time has been spent but with no success. An unwarranted delay in this decision for conversion can result in increased morbidity and mortality. To prevent these dreadful consequences, a large number of studies have been conducted on the importance of various preoperative predictors (like ultrasound finding of difficult gallbladder) in determining the chances of conversion from laparoscopic cholecystectomy to open cholecystectomy.<sup>7</sup>

The present study was conducted in the Department of surgery, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh with the objective to study the factors responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy. A total of 120 patients were included in the study.

In the present study, conversion of laparoscopic

cholecystectomy to open cholecystectomy was higher among age 51-60 years than other age groups. There was no significant ( $p>0.05$ ) association of age with outcome of surgery. Similar to this study, Liu et al (1996)<sup>8</sup> found that age > 65 years had higher incidence of conversion. Awan et al (2018)<sup>9</sup> reported that out of a total of 363 patients aged <60 years, 17 (4.7%) needed conversion to open while as out of 87 patients aged >60 year 9 (10.3%) needed conversion to open cholecystectomy. Simopoulos et al (2005)<sup>10</sup> significantly correlated age with an increased conversion rate of laparoscopic cholecystectomy to open cholecystectomy. Fried et al (1994)<sup>11</sup> reported that it was difficult to delineate the anatomy in elderly patients with a long history of gallbladder disease.

In the present study, chronic cholecystitis with cholelithiasis was the most common ultrasound finding. In total of 120 patients 96 (80%) had chronic cholecystitis with cholelithiasis. Acute cholecystitis with cholelithiasis was in 21 (17.5%) patients. Mucocele was in 3 (2.5%) patients. Our study observed that conversion of laparoscopic cholecystectomy to open was higher in patients with chronic cholecystitis with cholelithiasis (9.4%). There was no significant ( $p>0.05$ ) association of outcome of surgery with USG findings. Awan et al (2018)<sup>9</sup> evaluated that out of 326 cases with no previous history of acute cholecystitis in past, 13 (4.0%) patients were converted to open cholecystectomy whereas 12 (9.7%) out of 124 cases were converted to open in patients with history of acute cholecystitis in past. Fried et al (1994)<sup>11</sup> and Nachnani and Supeet et al (2005)<sup>12</sup> observed that the patients who had acute cholecystitis at any time in the past tend to have an increased likelihood of conversion during laparoscopic cholecystectomy. Liguori et al (2003)<sup>13</sup> while studying patients with acute cholecystitis found conversion rate of 15% in early operations (less than 72 hours) and 23.8% in operations delayed for more than 72 hours. In a retrospective analysis by Chahin et al (1999)<sup>14</sup> over a three-years period of 557 patients who underwent laparoscopic cholecystectomy 88 patient had acute cholecystitis. They concluded that conversion rate was 22% in acute cholecystitis patients as compared to 5.5% in case of patients with chronic cholecystitis.

Single calculi were among majority of patients, 85(70.8%) out of 120 patients had single calculus in this study. In the present study, conversion was higher among whom calculus was multiple. Out of 10 converted cases, 6 (17.1%) had multiple calculi and 4 (4.7%) had single calculus. There was significant ( $p=0.02$ ) association of outcome of surgery with calculi. Gill et al (2016)<sup>15</sup> observed that the conversion rate, in patients with a single stone and multiple stones, was found to be similar (20%).

In this study out of 10 converted cases, 5 (50%) were converted due to adhesions, which is considered the most

common reason for conversion, followed by Obscured anatomy-Frozen Calot's in two cases (20%) out of 10 converted cases, Bleeding cystic artery in two cases (20%) out of 10 converted cases and CBD injury in one case (10%) out of 10 converted cases. Awan et al (2018)<sup>9</sup> reported similar findings as in the present study in which adhesions were the most common cause of conversion in 12 (2.7%) patients. 82 cases were having adhesions out of which 70 were managed laparoscopically and 12 cases had to be converted to open cholecystectomy. 16 patients had obscured anatomy at Calot's triangle, out of which 5 had to be converted. Bleeding, visceral injury, instrumental failure and CBD injury were the other causes for conversion. Memon et al (2011)<sup>16</sup> evaluated the factors which were responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy. In their study they took a total of 123 patients, who underwent for laparoscopic cholecystectomy. Twelve (9.8%) patients required conversion to open cholecystectomy due to common bile duct injury.

#### Limitations

Most of our studies are accordance with majority of other similar study.

The discordance of data with other studies can be attributed to the fact that our study has small sample size, with female predominance in cases and short duration of study period.

To overcome this discrepancy, study with larger sample size and long duration of study may be required.

## CONCLUSION

A total of 120 laparoscopic cholecystectomy were performed. Out of 120 patients, ten required open conversion. Factor responsible for open conversion were dense adhesion in five cases out of ten converted cases, obscured anatomy at frozen Calot's in two out of ten converted cases, bleeding cystic artery in two out of ten converted cases and common bile duct injury in one out of ten converted cases. Hence adhesion was the most common reason for conversion (50%) followed by obscured anatomy-frozen Calot's (20%), bleeding cystic artery (20%) and common bile duct injury (10%).

Laparoscopic cholecystectomy is the gold standard in the management of symptomatic gallstone disease. However, many situations make it inevitable to convert the procedure to open. It is therefore mandatory to explain to the patients about the possibility of conversion to open technique at the time of taking consent for laparoscopic cholecystectomy. In present study, most common cause of conversion was adhesion followed by obscured anatomy-frozen Calot's, bleeding cystic artery and common bile duct injury.

These causal variables are intra-operative events and hence cannot be used as factors to predict conversion before operations. But early peroperative sensitization of difficulty can better prepare a surgeon to deal with intra-operative challenges and help the surgeon to make an early decision to convert to the open. Conversion to open is considered sign of wisdom rather than sign of failure as it minimize chances of various serious complications which may arise during difficult laparoscopic cholecystectomy.

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